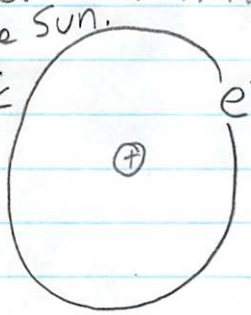
Ch 4 PT 1 Notes (Student)

Ch. 4 Electrons

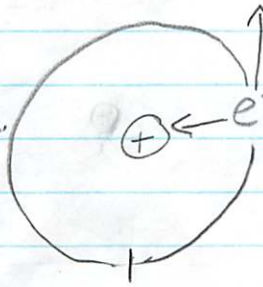
1911: Neals Bohr
↳ Looked at Bright Line Spectrum of Hydrogen.
↳ Elements have unique Bright Line Spectrum. (can be used to identify elements)
↳ Bohr said that electrons(e^-) were absorbing E and causing those spectral lines.
↳ Developed a model of the atom based on those spectral lines.

Rutherford's Model
↳ Electrons orbit the nucleus like planets orbit the sun.
↳ Wrong b/c electrons do not crash into the nucleus
↳ Does not explain E-energy



Bohr's Model
↳ Electrons circle the nucleus in 2-dimensional orbits.

Energy
Lowest Level - called ground state. only one (e^-)
ex. a. → (+) (e⁻)



↳ Pulls split the difference of eachother (keep the electron moving in a circle).
a. ↳ When energy is added to the atom, the electron absorbs the energy, the energy "jumps" to a higher energy level.
b. Electrons in higher levels are in the "excited state" where they are unstable and fall back to lower E levels

C. e^- give off energy when they fall down.
↳ Energy is visible light which is seen as the unique levels of the Bright Line Spectrum.

Bohrs Model (wrong)
↳ Only works for Hydrogen
↳ No other elements Bright Line Spectrum matched his proposed energy levels.
↳ No explained Reactivity.

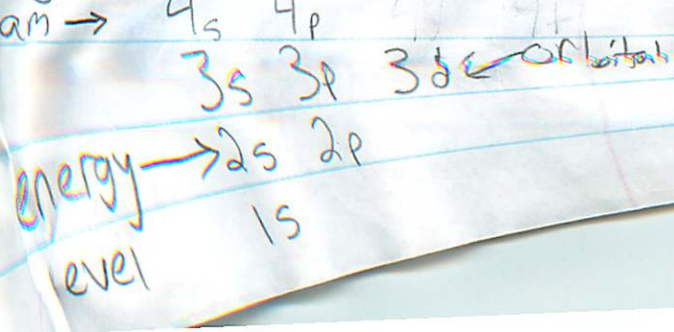
Current Model:

↳ Quantum Model

* ↳ Electrons act like waves, not particles
* ↳ Schrödinger's wave equation to give 3 dimensional space with the highest probability of finding electrons.
* ↳ Heisenberg's Uncertainty Principle:
  ↳ It is impossible to know precisly where an electron is and how fast it's going.
  ↳ We can only know the space with the best Chance of finding an electron.

Parts of the Quantum Model

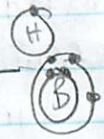
1. ↳ Quantum Numbers
   ↳ Solutions to wave equations that tell you where electrons might be.
   - Principle Quantum Number (n)
     ↳ Indicates energy level where electrons are. ($n = 1 \rightarrow 7$)
   - Angular Quantum Number (ℓ)
     ↳ Indicates which orbitals with in the energy electrons are in
     ↳ ℓ = s, p, d, f
2. Number of electrons orbitals hold
   s - 2 e⁻ max
   p - 6 e⁻ max
   d - 10 e⁻ max
   f - 14 e⁻ max
3. Filling Order Aufbau Principle
   ↳ Add electrons to atoms from lowest to highest energy levels
   ↳ Filling Diagram →



Electron Configurations

↳ List which energy level & orbital are filled.

H: 1 e^-	$1s^1$
B: 5 e^-	$1s^2\ 2s^2\ 2p^1$
C: 6 e^-	$1s^2\ 2s^2\ 2p^2$
Mg: 12 e^-	$1s^2\ 2s^2\ 2p^6\ 3s^2$
F: 9 e^-	$1s^2\ 2s^2\ 2p^5$
Al: 13 e^-	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$
Cl: 17 e^-	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$



B - 5 e^-

Mg

F

Al

core electrons | Valence electrons

B - 5e⁻	$1s^2 \mid 2s^2\ 2p^1$	2 Valence electrons
Mg - 12e⁻	$1s^2 2s^2 2p^6 \mid 3s^2$	
F - 9e⁻	$1s^2 \mid 2s^2\ 2p^5$	- 7 Valence electrons
Al - 13e⁻	$1s^2 2s^2 2p^6 \mid 3s^2\ 3p^1$	- 3 Valence electrons

Valence electrons - outer shell electrons

↳ Max of 8

↳ Highest energy level S+P electrons

Core Electrons - Inner shell electrons

Electron - Dot Notation

↳ Shows Valence electrons around the elements symbol as dots.